Philadelphia's Trap of Grease: National Energy Policy Versus Urban Realities

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PHILADELPHIA'S TRAP OF GREASE
National Energy Policy Versus Urban Realities

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This essay contends that national energy policy both purposefully and indirectly disadvantages a Philadelphia-based initiative that would simultaneously foster energy self-reliance, help improve the city's air quality, lower costs associated with wastewater treatment, and provide an alternative to imported petroleum-based vehicle fuel. Although some of the obstacles confronting this initiative are endemic to the character of Philadelphia's fractured approach to urban management, this article suggests that a change in national energy policy could do much to enhance Philadelphia's prospects to develop a commercial-scale biodiesel production facility that exploits a trap grease, an as yet virtually unutilized ingredient for making a biogenic fuel.

Keywords: *biodiesel; urban sustainability; Philadelphia; alternative fuels*

Like many cities across North America, Philadelphia faces rising energy costs to fuel public fleets and increasing public pressure—and government mandates—to reduce noxious air emissions associated with operating heavy-weight public transport vehicles. In this context, biodiesel could be an attractive option for Philadelphia because biodiesel—diesel fuel made from biological rather than geological ingredients—is both renewable and emits far less numerous undesirable chemical compounds. Nonetheless, biodiesel, which is primarily produced in America's grain belt, at present generally costs more than regular petroleum diesel. The quality of urban air and the volume of public consumption of imported petroleum-based fuels in Philadelphia (the fifth largest city in the United States) suggests that adoption of alternative energy practices in the metropolitan area would constitute an important benchmark in how the country reconciles environmental and economic realities and needs for urban residents. Toward that end, a private, cooperatively owned venture to manufacture locally made biodiesel from locally produced waste kitchen grease holds significant promise for helping Philadelphia both reduce pollution and promote affordable renewable fuel consumption. However, this project, Philadelphia Fry-O-Diesel, has encountered some difficulty in getting off the ground. The challenges facing Fry-O-Diesel range from the parochial to the technical; indeed, some problems reflect the idiosyncrasies of Philadelphia's peculiar "anti-social" character that seems to perennially thwart efforts to bring good governance principles to bear on efforts to manage the city's more intractable problems (see Dilworth, 2006). And although it might be easy to consign Fry-O-Diesel's start-up struggles to Philadelphia's habitual municipal dysfunctionalism, this essay will contend, rather, that Fry-O-Diesel's most significant challenges lie in an unbalanced federal policy framework that sets up market conditions that disfavor urban biodiesel businesses based on waste food feedstocks.

This essay thus explores how the current concatenation of federal energy and environmental policies, while seeming to promote urban sustainability, actually hampers sustainability in at least one important area: that of facilitating local renewable fuel production from

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specifically urban sources. This policy framework, created by federal laws, grant programs, market incentives, and regulatory oversight, effectively pits agricultural, virgin oil feedstock producers of biodiesel against urban-industrial, recycled oil feedstock producers. Most significantly, by disfavoring urban producers, this policy framework fails to encourage initiatives such as Fry-O-Diesel from exploiting a recyclable feedstock whose conversion into a vehicle fuel would in turn help combat another rising and costly problem for municipal areas. Fry-O-Diesel plans to make fuel from trap grease, the waxy water that collects in containers mounted beneath commercial kitchen sinks to capture fats and oils that wash down the drain in the normal process of kitchen cleanup. Improper maintenance of traps, however, has spawned a burgeoning municipal nightmare. Overflowing grease traps from commercial kitchens spew a gelatinous mess into sewage collector systems, causing hundreds of millions of dollars of damage across the United States every year and composing up to half of the sewer line blockages faced by cities such as London and New York (George, 2006; Newman, 2001). Without some initial support through policy initiatives, trap grease not only will remain the cheapest unexploited feedstock for biodiesel but also will continue to grow as an expense borne by already cash-strapped wastewater utilities and their citizen ratepayers.

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The pages below provide first a brief description of biodiesel, then an overview of the policy framework and how it has disadvantaged initiatives such as Fry-O-Diesel, and finally a brief conclusion with suggestions for what kinds of policies might create a more amenable environment for Fry-O-Diesel.

The Bio Boom

At first glance, the biodiesel industry in the United States appears to be a stunning success of energy policy innovations in just more than a decade; an incipient industry in 1992, it now grows by as much as 300% a year and consistently exceeds analysts' predictions.

A quick review of many biodiesel blogs and producer and supplier Web sites suggests that some of this growth appears inspired by the prevailing national sentiment to wean the American fleet off foreign oil. But biodiesel, along with corn-based ethanol—the primary agricultural alternative to petroleum gasoline—also promises sustainability benefits that traditional petroleum-based fuels lack. Biofuels (in contrast to petro fuels) come from "renewable" sources of energy that—as biofuel promoters like to tout—are infinite (see Tickell, 2003, p. 19), whereas their petroleum counterparts are decidedly finite (see especially Deffeyes, 2003). Thus, for both those worried about energy security and those convinced that fossil fuels' exploitation has peaked and will only grow more costly, biofuels in general, and biodiesel in particular, appear as something of an unprecedented response to a recent shift in the U.S. federal energy policy. Biodiesel, like corn-based ethanol, also offers a cleaner alternative to dirty petroleum hydrocarbons, a feature whose appeal demonstrates the deep penetration of the environmentalist ethic into the everyday thinking of ordinary Americans (cf. Estil, 2005; Pahl, 2005; Tickell, 2003).

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Biodiesel, as defined by both the industry's main trade group, the National Biodiesel Board (NBB), and the U.S. federal government, is diesel fuel made from any vegetable or animal fats and oils.[1] In its pure or "neat" form, it contains virtually no sulfur or aromatics, and, as its advocates like to say, it is "as biodegradable as sugar and less toxic than table salt" (Tickell, 2003, p. 37).[2] In comparison to pure petroleum diesel, pure biodiesel yields 67% fewer hydrocarbon emissions, the component in diesel exhaust that most contributes to localized smog and ozone formations. It also produces 48% less carbon monoxide and 47% fewer particulates, the gritty black smoke associated with "dieseling."[3] In life-cycle analyses, biodiesel is considered carbon neutral in that it adds no additional carbon to the atmosphere, one of the principle ingredients in global warming. And although nitrous oxide (NOx) emissions increase between 5% to 10% with biodiesel, its lack of sulfur keeps NOx from forming local smog or ozone.[4]

Biodiesel can be blended in any proportion with petroleum diesel and can fuel compression ignition (i.e., diesel) engines with no modification.[5] Blends are referred to as B20 for a blend of 20% biodiesel and 80% petroleum diesel, B50 for a 50-50 blend, and so on. Although it contains slightly less energy than petroleum diesel (yielding fewer miles per gallon), its lower energy content is offset by its better lubricity, which increases the fuel's mechanical performance.

No comprehensive fleet surveys exist at present, but anecdotal evidence indicates that despite facing rising fuel costs (B50 and B20 generally cost slightly more than Number 2 Diesel), public fleet managers are shifting to B20 in unprecedented numbers, and some have even embraced higher ratios of biodiesel, including the ongoing use of B50 in Cincinnati's Southern Ohio Regional Transit Authority. According to the National Association of Fleet Executives, in 1999 only 3 major fleets used B20. Four years later, in 2003, more than 300 fleets across the country had switched to B20 ("The Right Choice?," 2003). NBB currently uses the figure of 600 fleets in 2006 but speculates that actual fleet usage is much higher because some states now require that all diesel sold carry some blend of biodiesel (e.g., B20 in Minnesota; see NBB, 2006).

As fleets increase their consumption of biodiesel, production capacity has also grown at a monumental pace. *Biodiesel Magazine's* annual survey of projected capacity recently reported that 2007 may see capacity in the United States and Canada expand to 65 plants capable of producing 2 billion gallons, up from 36 plants with 400 million gallons of capacity in 2006 (McElroy, Jessen, Kotrba, & Nilles, 2006, pp. 36-37). This amounts to a "staggering" leap forward from just 30 million gallons of biodiesel produced in 2004 in 20 plants (Kotrba, Nilles, Williams, & Bryan, 2005) and a mere 500,000 gallons produced in 1999 (Pearl, 2001).

Biodiesel Equals Agrodiesel

Seed oils provide the primary feedstock for most of the commercially available biodiesel. Soy oil is the leading feedstock for U.S. biodiesel, a direct result of soybean growers' efforts to expand uses and markets for their crop, beginning in 1992 with the formation of the National Soy Diesel Development Board, NBB's predecessor. This trade group claims to have directly shaped most of the critical conditions that have stimulated biodiesel's precipitous rise. By most accounts in the industry, including those of NBB, the two most important policies that have prompted biodiesel's growth in the United States are the 1998 amendments made to the Energy Policy Act of 1992 (EPACT) and the 2004 federal excise tax credit, both of which were strongly lobbied for by the NBB. EPACT has helped generate a growing appetite for biodiesel, whereas the tax credit has helped encourage producers to meet that appetite. Originally, EPACT aimed to reduce America's dependency on foreign oil by mandating that all federal and state fleets that draw from common fuel sources must gradually phase in alternatively fueled vehicles (AFV), such as natural gas and electric vehicles. But thanks to NBB's persuasive efforts, in 1998 EPACT permitted that in lieu of some new vehicle purchases (specifically larger vehicles that were previously exempt from EPACT), fleets could acquire "credits" to meet EPACT compliance for every 450 gallons of B100 consumed in existing vehicles. This change to EPACT has undeniably generated more market for biodiesel. And to lure producers to invest in a potentially volatile new fuel commodity, Congress granted a federal excise tax credit (now extended to 2008) that is worth up to $1 for every gallon of biodiesel sold.

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In addition to policies that directly encourage biodiesel production and consumption, NBB's efforts to seek EPA endorsement of biodiesel as a clean fuel have led to local fleets' use of biodiesel to meet their targets to lower emissions under the Clean Air Act of 1990. Although there is no specific mention of biodiesel in the Clean Air Act, the characteristics of biodiesel—as successfully promoted by the NBB to the EPA—have turned the Clean Air Act into a de facto element of the policy framework spurring biodiesel's growth because biodiesel can help fleets lower their noxious emissions. In this manner, similarly, the Clean Air Act's Ultra Low Sulfur Diesel (ULSD) requirements that went into effect in October 2006 have also prompted interest in shifting from petroleum diesel to biodiesel in various proportions because biodiesel's absence of sulfur provides an easy means to meet the challenges of the ULSD mandate. A host of other programs from a variety of government agencies have also helped incentivize production, infrastructure development for distribution, and fleet consumption. These programs reflect a wide array of federal agencies that have actively promoted biodiesel, including an IRS income tax credit for gas stations to offset expenses in installing tanks and pumps and a school bus grant to improve air quality for children.

Backyard Home Brewers and Big Vats of Soap and Paint

Biodiesel does have its critics, and they tend to point to its agricultural origins, noting that as biodiesel and ethanol grow in market share, they will inevitably compete for cropland with food production and food security. Moreover, critics note that biofuels require significant energy to yield usable energy to fuel vehicles. To evaluate biofuels' overall efficiency, analysts look at the fuels' energy balance, or the difference between energy expended in growing, processing, and delivering a gallon of fuel and the energy potential (in BTUs, generally) contained in that gallon. Ethanol sustains the harshest judgments because in some analyses it contains a negative energy balance, whereas most analyses generally regard biodiesel as possessing a 25% to 38% positive energy balance, though some critics, such as Cornell ecologist David Pimental, insist that all biofuels have negative energy values. In light of the energy balance concerns, some proponents of biodiesel have advocated an alternative approach to developing feedstocks: using waste animal and vegetable fats, oils, and greases.

Americans consumed about 55 billion gallons of diesel in 2005 (compared to about 3 times that for gasoline), and the vast majority of that consumption took place among independent freight haulers or in fleets of a dozen to several hundred vehicles, such as commercial transport companies and municipal bus lines. Only an estimated 2.0% to 3.4% of passenger vehicles in the United States operate with diesel engines. And although biodiesel grows in attraction for fleet managers, it sustains probably at least as much interest—if not more—at present among passenger vehicle drivers who brew biodiesel at home from locally available sources of waste vegetable oil such as used restaurant fryer grease. These do-it-yourselfers represent a tiny percentage of potential biodiesel consumers, but their approach to biodiesel as a form of materials reuse and energy recovery has influenced a broader interest in biodiesel as an environmentally friendly fuel that can be made from waste products. Moreover, their approach to biodiesel has helped champion its prospects for contributing to sustainability, broadly construed. Unlike ethanol home brewers who have always remained few and far between, biodiesel home brewing is a burgeoning grassroots movement with a sizeable following.[6] This grassroots recycling movement has arguably helped to propel biodiesel's growing fame as a unique fuel that can both absorb waste material and turn it into domestically produced energy. Some advocates of biodiesel note that fuel made from waste grease improves its energy balance simply because the waste fryer grease would otherwise be thrown away and thus does not entail the energy costs that virgin oils do in the production of biodiesel. In fact, one life-cycle study by the U.S. Energy Information Administration argued that biodiesel made from recycled sources is decidedly more energy efficient than biodiesel made from virgin soy oil (Radich, 2004).

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But across America, supplies of waste cooking oil will yield, at most, 100 million gallons a year of biodiesel, a mere 2% of the current diesel consumption in the country. More importantly, commercial-scale biodiesel producers face stiff competition for the used oil itself. Much of the fryer grease from restaurants gets deposited into buckets or dumpsters behind commercial kitchens, where it starts a second life as the raw material for a large industry that processes it for a host of secondary uses. Depending on the volume of grease they throw out, restaurants and food processors will either pay or be paid for their used grease. The grease gets hauled to rendering facilities, boiled to drive off excess water, filtered to remove food particulates, and transformed it into a commodity called "yellow grease." Yellow grease winds up in animal feed, cleaning products, paint, cosmetics, and adhesives. It has a lively overseas market (at present, Asian countries consume most of it), and thus to obtain it in sufficient volume for a feedstock, biodiesel producers must purchase it at the prevailing market rate. In contrast, home brewers often procure their grease through a number of means (with or without the permission of grease producers) that allow them to bypass the rendering industry and thus avoid paying for their grease. For home brewers, used grease has essentially no cost. For commercial-scale producers of biodiesel, yellow grease is generally cheaper than virgin soy, but its price moves in tandem with fluctuations in the world price for soy oil (Radich, 2004). Thus, although many promoters of fryer grease–based biodiesel like to claim that biodiesel made from waste oil makes good use of an otherwise "troublesome waste product" (Journey to Forever, 2006), this claim belies fryer grease's long-standing essential position in the manufacture of many goods and its actuality as a hotly traded commodity.

Trap Grease: Rescuing BTUs From Down the Drain

With prices ranging in the past year from $0.11 to $0.15 per pound (roughly $0.77 to $1.05 per gallon), yellow grease is hardly free; it is thus not a waste, as popular wisdom on biodiesel suggests, but a valuable raw material whose competing markets, both national and international, can make biodiesel producers vulnerable to its wide price fluctuations (in 1997 it ranged from $0.10 to $0.20 a pound, or $0.70 to $1.40 a gallon, at a time when diesel fuel retailed for just less than $2.00; see Wiltsie, 1998, p. 9). Nor do biodiesel's other ingredients come without notable costs.

Chemically, the production of biodiesel involves a relatively uncomplicated formula: Methanol mixed with biologically produced oils, in the presence of a catalyst, will yield methyl esters of free fatty acids (FFAs)—the chemical name of biodiesel—and glycerin. This process, called transesterification, replaces naturally occurring glycerin in fats and oils with alcohol. Home brewers do this simply by agitating their ingredients and letting the two products separate over time using gravity (glycerin is more dense than biodiesel). This follows with washing off the excess methanol-catalyst mixture and "drying" the fuel (letting the water and fuel separate, also by gravity). However, producing biodiesel quickly, in commercial quantities and in a form that meets industry and government quality standards, requires the use of heat and pressure, both of which entail energy costs. In addition, the composition of the feedstock matters considerably. Waste greases typically possess high quantities of FFAs (all oils possess some FFAs, but heating concentrates them). High FFA feedstock must be catalyzed with an acid, rather than a base, and requires more heat and more methanol and thus produces more glycerin (which must be disposed of). But most importantly, recycled oils require pre- or postprocessing steps (sediment filtering and dewatering), steps not required by biodiesel made from virgin feedstocks.

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Even home brewers must pay for their catalyst and methanol; again, costs are not insignificant. Methanol, a fossil fuel, can cost as much as $7 to $8 a gallon, though most small-scale producers can procure it for closer to $2 to $3 a gallon, entailing approximately a $0.60 to $0.90 per gallon cost to the final fuel.

In contrast to fryer grease, which should be characterized as a false waste, trap grease is in actuality a true waste; there are no uses for trap grease, at present, and trap grease's processing protocols are designed simply to meet federal, state, and local requirements for disposal. Environmental and sewer codes throughout the country require that commercial kitchens and food processors install grease traps to capture oils and fats that slurry around on kitchen floors and in the bottom of sinks and washers. The traps keep grease contained in wash water from entering the sewage collector system. By regulation, traps should be cleaned and pumped out on a regular basis. Because traps contain hydrolyzed (i.e., water-logged) grease and dry grease, a substantial volume of water, and a considerable volume of particulate matter, trap grease haulers must separate greases and particulates from water, returning the water to sewage treatment plants and hauling the oily residue to landfills. There, the residual grease might be composted, bound with lime, or sometimes burned. Trap grease haulers must pay for both forms of disposal of trap grease's separated components. Haulers make their profit on the margin between their own disposal costs and what they charge commercial kitchens for their trap grease servicing. Because most trap grease haulers are not part of vertically integrated solid waste management companies, and because most wastewater treatment facilities are either municipal monopolies or public utilities, trap grease haulers seek to keep their processing and carting costs as low as possible because their profits are constrained by the prices set by landfills that charge fees for tipping and wastewater plants that charge for industrial effluent treatment.

The National Renewable Energy Laboratory estimates that trap grease volumes amount to about 13 pounds per person per year in urban areas in the United States; this corresponds to approximately 3,800 million pounds of trap grease, which could potentially yield 495 million gallons of biodiesel annually (Tyson, 2002, p. 8; Wiltsie, 1998, p. 7), or nearly 5 times as much as could be produced from yellow grease.

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Because of trap grease's character as a true waste, Philadelphia Fry-O-Diesel elected to develop reactors and production facilities designed specifically to take advantage of this abundant and unrealized feedstock. Although not technically free (Fry-O-Diesel will need to work with trap grease haulers in some capacity until its plant is self-sustaining), trap grease can meet the environmental goals of making a fuel by recycling what would otherwise be waste materials or, as another biodiesel chemist has put it, "keeping BTUs from going down the drain."

From the Fryer to the Reactor: Fry-O-Diesel

Trap grease, according to the National Renewable Energy Laboratory, composes an unutilized resource that could both advance energy security and help clean the environment. For the founders of Philadelphia's Fry-O-Diesel, trap grease provides the opportunity to decentralize sourcing of biodiesel and make it a truly homegrown, locally made fuel source that recovers the otherwise lost energy potential in an undisputed waste for which there is, at present, no market value. Trap grease, in the words of Fry-O-Diesel's director, Nadia Adawi, makes good environmental sense because "we believe in using what you've got and what we've got is restaurants" (McElroy, 2006, p. 70). Indeed, Fry-O-Diesel's mission sounds much like that of the home brewers and do-it-yourselfers who advocate making local fuel from local resources to achieve sustainability. Fry-O-Diesel started as a for-profit subsidiary of the 25-year-old Energy Cooperative, a Philadelphia-based, member-owned organization that provides low-cost heating oil and electricity to 6,500 households. In 2002, the cooperative established Fry-O-Diesel for the purpose of finding an affordable, renewable alternative to home heating oil. Thus, in its very core mission, Fry-O-Diesel's mirrored those of many home brewers: make economically affordable fuel from sustainable resources that are otherwise wasted.

Armed with a nearly $400,000 Energy Harvest Grant from the Pennsylvania Department of Environmental Protection (DEP) in 2004, Fry-O-Diesel leveraged in-kind support from the U.S. Department of Agriculture and the College of Engineering at Philadelphia's Drexel University. The group's initial challenge rested simply in assaying the chemical qualities of the potential feedstock. With extensive testing of trap grease, thanks to the cooperation of haulers in Philadelphia, the group found that trap grease is far more variable than either virgin soy oil or yellow grease in its most important component: the percentage of FFAs. Tests showed that it varied from around 50% to 90%, though on occasion they found samples that contained only 4% FFA (comparable to virgin soy). Because biodiesel's recipe differs depending on the percentage of FFAs, Fry-O-Diesel had to figure out how to engineer its process to homogenize a heterogeneous feedstock and reduce the variations in FFAs to a more manageable range. Fry-O-Diesel's complicated design, including significant pre- and postprocessing, has proven successful: In July 2006, their fuel passed well within the quality standards of the diesel fuel industry (known as ASTM D6751). In fact, Fry-O-Diesel's fuel exceeded some criteria that have not yet been included in ASTM quality-assurance analysis (see Fry-O-Diesel, 2006).

Fry-O-Diesel's complicated design, including significant pre- and postprocessing, has proven successful: In July 2006, their fuel passed well within the quality standards of the diesel fuel industry.

But more challenges confront Fry-O-Diesel than simply producing uniform fuel from a very heterogeneous feedstock. This chemical and engineering problem comprises but one factor in the complicated effort to make biodiesel from locally available sources in Philadelphia. From the beginning, Fry-O-Diesel has struggled to find a suitable site for its production facility. Its current pilot plant, housed in a once derelict machine shop in Philadelphia's Kennsington neighborhood, would seem to be ideally suited for an area of the city zoned for heavy industry and offered incentives for brownfield redevelopment. All around Fry-O-Diesel, small businesses operate in the materials reclamation industry. Nonetheless, Fry-O-Diesel did not receive much of a welcome from residential neighbors and faced antagonism from a local politician (Angel Cruz) to locate its facility (see Schwartz, 2005). Fry-O-Diesel's struggle here is not unique—for example, one of the largest environmental groups in the United States, the Natural Resources Defense Council, foundered on similar political shoals in its unsuccessful effort to build a state-of-the-art, energy efficient, and nonpolluting newspaper recycling plant in New York City's South Bronx (Harris, 2003). But Fry-O-Diesel's challenges did not stop there. The ideal site to locate its scaled-up operation, a 3 million gallon a year facility, is one of Philadelphia's three wastewater treatment plants. After all, trap grease haulers have to deliver their semiprocessed waste to the facilities eventually. But after initial enthusiasm from the city's treatment plant operators, serious consideration to embark on a joint venture never materialized.

This is curious in part because a project undertaken with Fry-O-Diesel could benefit ratepayers in ways not immediately obvious to the public but no doubt well understood by utility operators. Although local environmental regulations require routine emptying of restaurant grease traps, throughout the country, there is little oversight to ensure compliance. As a result, grease traps frequently overflow, hidden out of sight below ground level. In accordance with trap designs, the traps shed their excess volume down into sewer mains, where grease accumulates on collector walls, approximating, as the *Wall Street Journal* poetically observed, the clogging of sewer arteries (Newman, 2001). Grease clinging to sewer lines forms large masses of solid fat that impede the flow of sewage, causing the urban equivalent of a heart attack: sewage backups, sewage spills, and collector cave-ins. When grease balls eventually reach wastewater treatment plants, they can wreak havoc on the delicate balance of digesting bugs that decompose sewage. Swamped with fats, oils, and greases (or FOGs, as the American Society of Mechanical Engineers calls them), sewage processing slows down and can sometimes falter.

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In fact, Fry-O-Diesel offered to help ameliorate the expense to the utilities of grease events by lowering the cost of trap grease disposal (and thereby encouraging compliance through market means). But according to Fry-O-Diesel's Adawi, Philadelphia's treatment plant engineers insisted to city management that no grease problems exist in Philadelphia. Thus, with no prevention incentive to warrant colocation for plant operators, Fry-O-Diesel was forced to abandon efforts to house its facility at a Philadelphia treatment plant. Fortunately for Fry-O-Diesel, trap grease haulers in the Philadelphia area have a number of alternatives for disposing of their grease; many use treatment plants in neighboring municipalities, including some in New Jersey. Thwarted in their effort to keep local BTUs locally processed, Fry-O-Diesel has entered active negotiations with neighboring facilities and plans to have its facility online by 2007, transforming Philadelphia's trap grease into a fuel for Philadelphia energy consumers at a facility just outside city limits. They will make local fuel as locally as possible, given local obstacles.

Between Policy and the Market: A Trap in Itself

Producing biodiesel from trap grease is at present a costly undertaking that qualifies, according to the grant that funded Fry-O-Diesel's start-up, as experimental technology. To date, only one commercial-scale production facility in the country successfully manufactures large volumes of trap grease into a diesel fuel that meets ASTM. The plant, on Maui, in

Hawaii, can take advantage of a very unique set of circumstances available to it only because Maui's disposal costs and water reclamation costs are so high that its chief private sector waste management companies seek extreme measures to extend landfill life and lower costs for industrial liquid waste disposal. Under such closed market circumstances—Maui, it bears noting, is an island located far from the continental mainland—biodiesel becomes an attractive beneficial use for a waste that otherwise entails expensive disposal. Add to this the high price of all combustible fuels in Hawaii, and biodiesel likewise appeals to drivers and consumers of diesel fuel who regularly pay the nation's highest on-road prices. In short, biodiesel from waste oils probably would thrive on Maui without the current and pending federal policies that have prompted biodiesel's U.S. boom. This is not, however, the case for Fry-O-Diesel.

In general, biodiesel has prospects for a significant increase in market demand starting in October 2006, when all retail diesel vendors must meet new U.S. federal requirements to lower sulfur content from the current maximum of 500 parts per million to no more than 15 parts per million. Because biodiesel contains no sulfur, some retailers have opted to offer blends of B20 at retail pumps already frequented by long-haul truckers to comply with the new regulations. In addition, a host of state and local regulations mandating biodiesel in lower blends and/or offering tax incentives to producers, distributors, and vendors have effectively opened a market for biodiesel where there was little or none; these include current requirements in Minnesota that all diesel sold in state must contain at least 2% biodiesel and legislation pending in several other states.

Although all these policies have dramatically increased America's appetite for biodiesel (albeit through some forced feeding), they have done very little, in particular, to promote biodiesel from recycled or waste oils. In fact, another federal policy does quite the opposite; this policy, the federal excise biodiesel tax credit, is consistent with the generally incentive-based approach to environmental and energy policy in place in the United States since the early 1980s (Mazmanian & Kraft, 1999). As such, it is designed to create favorable market conditions for establishing alternative fuels' industries. The excise tax credit program seeks to promote biodiesel production by encouraging blenders to provide biodiesel in proportions acceptable to differing market conditions across the country. But this tax credit program purposefully favors biodiesel made from agricultural sources. This is no accident because, as noted above, the NBB began as the soy grower interest group. The program grants, currently, a one cent tax credit for every percentage of virgin seed oil biodiesel blended with petroleum diesel; thus, for every gallon of B100 that blenders sell, they can claim a $1.00 tax credit. By contrast, the program offers a tax credit half as valuable when blenders use biodiesel from recycled oil (or, in other words, a total potential credit on B100 of only $0.50).

Other conditions more insidious—and less driven by energy policy—put biodiesel producers seeking to close urban energy loops at a disadvantage when compared to their agricultural brethren. These conditions contribute to higher production costs and barriers to entry that do not obstruct biodiesel producers who operate in the countryside, where most virgin oil feedstock biodiesel plants are located. Biodiesel production that takes place on farms flies under much of the regulatory radar system that oversees urban biodiesel operations: Farm-based biodiesel plants do not need to apply for many permits required by urban-based producers, such as those for methanol storage, for effluent treatment or for their air emissions. By contrast, urban plants must secure all these permits.[7] The combination of tax prejudice and the relatively relaxed regulatory environment for farm-based biodiesel producers has prompted Fry-O-Diesel's Adawi to observe that for alternative fuels, "We don't have an energy policy, we have an agricultural policy" (personal communication, March 2006).

The combination of tax prejudice and the relatively relaxed regulatory environment for farm-based biodiesel producers has prompted Fry-O-Diesel's Adawi to observe that for alternative fuels, "We don't have an energy policy, we have an agricultural policy."

One of the more important characteristics of biodiesel initiatives based on trap grease feedstocks is the prospect that such initiatives could remove themselves from the vagaries of the commodity marketplace. Because trap grease is not a commodity, small-scale producers, such as Fry-O-Diesel, colocated or tied to municipal wastewater treatment plants, can shield themselves to some degree from buffeting by volatile commodity feedstock costs and in turn recover some of the advantage otherwise lost in facing farm-based producers. Large agriculture-based enterprises protect themselves from input cost fluctuations through economies of scale and regulatory freedom, conditions that Fry-O-Diesel and other urban-based, recycled feedstock producers do not and probably cannot enjoy if their goals are specifically to keep the energy balance of biodiesel favorable, to decentralize fuel production, and to promote local self-reliance. Thus, by exploiting trap grease, urban-based enterprises can face a more level playing field in the general biodiesel marketplace, which at present disfavors both their scale of operation and their most sensible feedstock.

Biodiesel made from virgin soybean oil has much to recommend it; its cleaner emissions can do much to improve air quality, combat global warming, and, thus, in general, advance environmental sustainability in the United States. Biodiesel made from waste oils, and trap grease in particular, could specifically improve urban sustainability and should be welcomed, given that the majority of Americans live in urban areas. But biodiesel from recycled feedstocks needs policy help, lest it be squeezed out in the marketplace by the more favored position held by virgin oil seed biodiesel. This policy help needs to take a more holistic approach to urban environmental problems, noting that incentives to convert trap grease into biodiesel would combat more than air pollution; it would also lower the costs of wastewater reclamation and close, as it were, more urban energy and material loops.

Notes

1. The more precise definition reads:

> Biodiesel is defined as mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats which conform to ASTM D6751 specifications for use in diesel engines. Biodiesel refers to the pure fuel before blending with diesel fuel (see http://www.biodiesel.org/resources/biodiesel_basics/default.shtm).

2. See also http://www.biodiesel.org/resources/biodiesel_basics/default.shtm.
3. See http://nbb.org/pdf_files/fuelfactsheets/emissions.pdf.
4. See http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf.
5. Nonetheless, the properties of biodiesel entail changes in routine maintenance schedules, depending on the blend of biodiesel, and entail different protocols for fuel storage and cold-weather use.
6. There is no easy, systematic way of comparing biodiesel home brewers to ethanol home brewers. To get a sense of how home brewing and cooperative small-scale biodiesel production from waste grease compare to home brewing of ethanol, one need only spend a few minutes with a Web search: biodiesel home brewing (and associated searches) produces nearly twice as many Web sites as home brewing of ethanol. This is curious because making fuel for gasoline engines by distillation has a much longer grassroots history. And there are vastly greater numbers of passenger cars powered by gasoline engines than by diesel engines. Nonetheless, perhaps because distillation requires a permit from the federal government, or perhaps because distillation is tricky and energy intensive, biodiesel has more of a grassroots following.
7. To be sure, many agricultural-based operations should apply for permitting, according to a representative who I spoke with at Michigan Department of Environmental Quality. And the very large operations do. Nonetheless, plants on the scale of Philadelphia Fry-O-Diesel, that is, small, farm-based facilities, manage to evade much permitting simply by calling their operations agricultural rather than industrial. Piedmont Biofuels in North Carolina, for example, operates a facility producing 1 million gallons per year without any permits, according to its director, Lyle Estill.

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